Expanding the genetic code for biological studies.

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Funding Grants: Genetic Encoding Novel Amino Acids in Embryonic Stem Cells for Molecular Understanding of Differentiation to Dopamine Neurons

Public Summary:

Scientific Abstract:
Using an orthogonal tRNA-synthetase pair, unnatural amino acids can be genetically encoded with high efficiency and fidelity, and over 40 unnatural amino acids have been site-specifically incorporated into proteins in Escherichia coli, yeast, or mammalian cells. Novel chemical or physical properties embodied in these amino acids enable new means for tailored manipulation of proteins. This review summarizes the methodology and recent progress in expanding this technology to eukaryotic cells. Applications of genetically encoded unnatural amino acids are highlighted with reports on labeling and modifying proteins, probing protein structure and function, identifying and regulating protein activity, and generating proteins with new properties. Genetic incorporation of unnatural amino acids provides a powerful method for investigating a wide variety of biological processes both in vitro and in vivo.